UDC 332; DOI 10.18551/rjoas.2022-11.27

MANGROVE TYPE AND DENSITY IN THE COASTAL TOURISM AREA OF BALAURING VILLAGE OF OMESURI SUB-DISTRICT, LEMBATA REGENCY, INDONESIA

Damianus Adar
Department of Agribusiness, Nusa Cendana University, Indonesia

Paulus C.A.*, **Aludin Al Ayubi**
Department of Aquatic Resource Management, Nusa Cendana University, Indonesia

Azmanajaya E.
Balikpapan State Polytechnic, Indonesia

*E-mail: chatepaulus@undana.ac.id
ORCID: 0000-0001-8507-3599

ABSTRACT
The mangrove ecosystem dominates coastal tourism on the coast of Lembata Regency. The potential of mangrove ecosystem is one of the tourist attractions for the community to carry out tourism activities. This study aims to determine the type and density of mangroves on the coast of Balauring village, Omesuri sub-district, Lembata Regency. The data collection technique used an observation technique with the observed parameters being mangrove species, density value, and relative density. The observation technique uses line transects at each observation point. The results only found *Sonneratia alba* with an average density value of 55.56 ind/ha and an average relative density value of 33.33%.

KEY WORDS
Mangrove type, mangrove density, coastal tourism area, Balauring Village.

The mangrove ecosystem is one of the unique ecosystems because it is a combination of terrestrial and aquatic ecosystems and has an essential role in the life and development of living things in shallow marine waters such as primary producers, nurseries, and foraging for marine biota, sediment catchers, anchors, abrasion and nutrient recycling (Retnowati et al., 2017). Another definition is also according to Raymond et al., (2010) that the mangrove ecosystem is a plant community or an individual plant species that forms a community in tidal areas. In line with this, Lapolo et al. (2011) stated that the mangrove ecosystem as a system in nature where life takes place that reflects the reciprocal relationship between living things and their environment and between living things themselves is found in coastal areas is affected by tides and is dominated by tree or shrub species that unique and able to grow in salty/brackish waters. The existence of a reciprocal relationship between living things and the environment, in this case, marine biota, can be reflected in the various marine biota that utilizes the mangrove ecosystem as a habitat and a place to find food and even humans in support their welfare, of course, use this mangrove ecosystem as an area to catch fish, shrimp, crab shells, and others whose results are consumed or sold to increase their economic level (Paulus et al., 2019).

Although the mangrove ecosystem is classified as a unique ecosystem and also has an important role in biodiversity in the coastal and marine environment, this ecosystem is also has vulnerability to various disturbances both from land and from the ocean (Yuliasamaya et al., 2014). Bengen (2001) also states that the factors that affect the life of mangroves in a habitat usually come from internal factors (natural factors) and external factors (humans). Internal factors that affect mangrove life can be in the form of high and low currents and waves; while external factors that affect the growth and life of mangroves in a habitat can come from community activities originating from land (Paulus et al., 2020), such as dumping garbage and waste into the sea and industrial activities and other anthropogenic

activities. Furthermore, external activities in the mangrove ecosystem can be in the form of mangrove logging activities, ship anchoring activities, the opening of pond areas, and also activities for catching biota that is destructive to mangrove ecosystems such as catching crabs, shrimp, shellfish, and others.

In an effort to develop tourism in the coastal area of Lembata Regency, the need for data and information from the mangrove ecosystem which is a tourist attraction is needed as an initial step to identify the potential of the mangrove ecosystem. The research was conducted to identify the type and density of mangroves in Balauring village, Omesuri sub-district, Lembata Regency.

METHODS OF RESEARCH

Research sites. This research was conducted during June-July 2022 in Balauring village, Omesuri sub-district, Lembata Regency. This tourist area is managed by the Balauring village Government in collaboration with the Department of Culture and Tourism, Lembata Regency. In the tourist area, there is an area for anchoring fishing boats, and mangrove and seagrass ecosystems. Infrastructure built as tourist infrastructure such as wooden bridges is provided to make it easier for tourist visitors to enjoy the scenery.

Figure 1 – The appearance of Research Locations for Coastal Tourism Areas in Balauring village: (a) Mangrove Ecosystem and Wooden Bridge, (b) Mooring Area for Fishing Vessels around Mangrove Ecosystem, and (c) Settlement around Mangrove Ecosystem

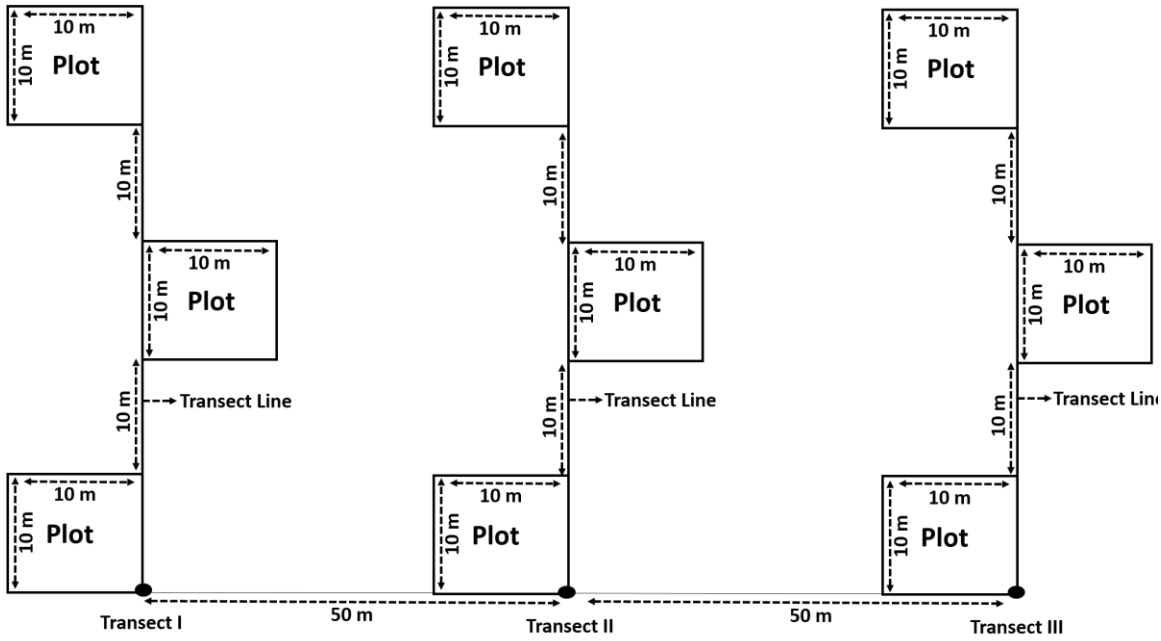

Figure 2 – Transect Observation of the Mangrove Ecosystem at the Research Site

Data collection techniques. The data collection technique in this study used an observation technique with the parameters observed being mangrove species, density

values, and relative density. In relation to the process of observing mangrove species at the research location, was carried out by following the instructions of the Minister of Environment Decree No. 201 of 2004, which was preceded by the establishment of observation points to place line transects. The number of observation points is 3 points, from each point 1 line transect is assigned, so the total number of transect lines for all observation points is 3 transect lines (Figure 2). The distance between one transect and another is 50 m, with the coordinates of the transect line placement at each point. In 1 line transect, 3 observation plots are set, so the total observation plots in 3 transect lines are 9 observation plots. The distance between 1 plot and another is 10 m with the size of the observation plot being 10 m x 10 m. Mangrove observations were continued with the identification of mangrove species by following the instructions of Noor et al., (2012).

Figure 3 – Data Collection Activities: (a) Line Transect Drawing, (b) Plotting, and (c) Mangrove Species Observation

Data analysis. The data on the density of mangrove species in this study were calculated following the instructions or formulas set by the Minister of Environment Decree No. 201 of 2004 as follows:

$$\text{Density value (D)} = \frac{\text{Number of individuals of a mangrove species}}{\text{Sample Plot Area}}$$

$$\text{Relative density value (DR)} = \frac{\text{Density of a Mangrove Type}}{\text{Density of All Types of Mangroves}} \; x \; 100\%$$

RESULTS AND DISCUSSION

The results of observations and measurements show that the area covered by mangroves in the tourist area in the coastal village of Balauring is ±0.15 ha or equivalent to 1500 m². In addition, from the identification results, it is also known that there is only 1 species of mangrove that grows to dominate the tourist area, namely the *Sonneratia alba* species with the tree category, while the seedling and sapling categories are not found in the tourist area. The type of mangrove *Sonneratia alba* found visually is shown in Figure 4.

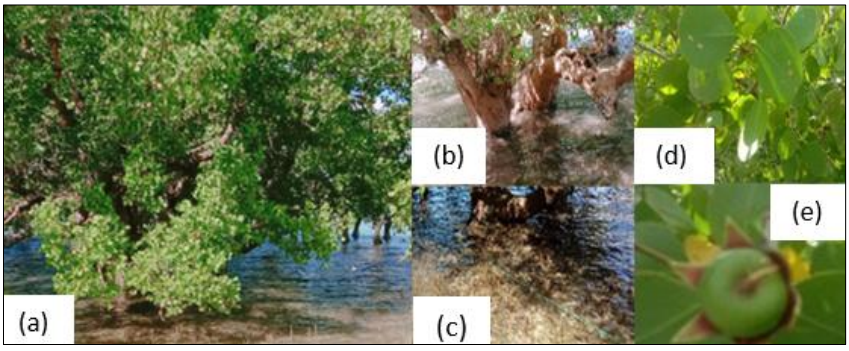

Figure 4 – Characteristics of *Sonneratia alba* Mangrove Species in Tourism Area on the Coast of Balauring village: (a) Trees, (b) Trunks, (c) Roots, (d) Leaves, and (e) Fruits

The only type of mangrove, *Sonneratia alba*, which is found in the coastal tourist area of Balauring village based on the visual appearance of Figure 4 has its own characteristics or characteristics, namely the color of the leaves is always green, grows spread, and reaches 15 m high. The bark is dark white to brown, with smooth longitudinal slits. The roots are cord-shaped beneath the substrate and emerge as respiratory roots which are blunt conical in shape and reach a height of 25 cm. Another feature observed was leafy skin with underdeveloped glands at the base of the petiole (petiole size 6-15 mm); while the fruit is round like a ball, the tip is stemmed and the base is wrapped in flower petals. The fruit contains many seeds (150-200 seeds) with a fruit diameter of 3.5-4.5 cm.

The results of the analysis of the density value and relative density of *Sonneratia alba* in the tourist area in Balauring village can be seen in the following graphic image.

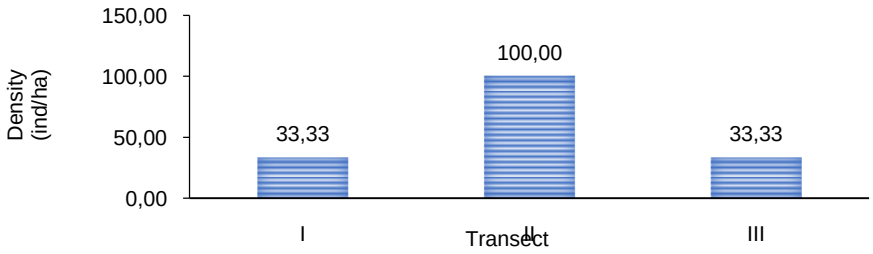

Figure 5 – The Density Value of *Sonneratia alba* in Balauring village

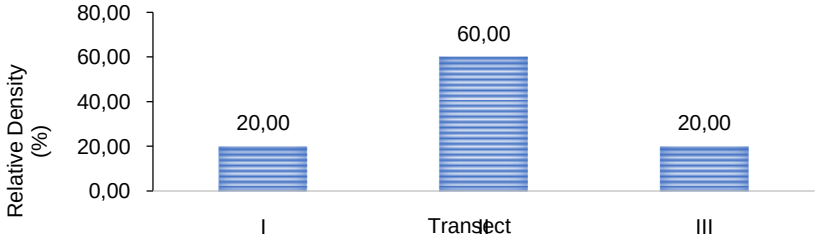

Figure 6 – The Relative Density Value of Sonneratia alba in Balauring village

In Figures 5 and 6, the density values and relative density of *Sonneratia alba* for transects I and III have the same value, each of which is 33.33 ind/ha with a relative density value of 20%, while on transect II the density value of *Sonneratia alba* of 100.00 ind/ha with a relative density value of 60%. The density range of *Sonneratia alba* ranges from 33.33 - 100.00 ind/ha with an average value of 55.56 ind/ha, while the relative density ranges from 20.00-60.00% with an average value of an average of 33.33%. The average density and relative density values from the analysis were used as benchmarks to predict the number of mangrove tree stands of the *Sonneratia alba* species which only reached ± 83.33 individuals or tree stands. Likewise with the average value of density and relative density, if used as a benchmark in determining the category of mangrove damage in the local area, it can be seen that the condition of the mangroves in Balauring village is in the rare/damaged category or has experienced degradation pressure (KLH, 2004).

The prediction of the results of the degradation/destruction of the mangrove ecosystem in the tourist area in Balauring village based on the previous description can be caused by certain factors. According to Bengen (2001), the factors that influence the growth and development of mangroves in a habitat usually come from internal factors (natural factors) and external factors (humans). Internal environmental factors that affect the life of mangroves are the high and low speeds of currents and waves. The higher the speed of currents and waves in the mangrove habitat, will have an effect on the death of mangrove plants, in this case at the seedling level which in its development goes to the sapling/sapling level and the tree level, resulting in the lower number of individual mangroves in the habitat. Likewise, the influence of external factors, as found by Sambu (2014), Fredrik et al., (2019),

and Koda (2021) that community activities originating from land, such as dumping garbage and waste into the sea and industrial activities and other anthropogenic activities.

Community activities from the mainland such as dumping garbage into the sea will directly cause sedimentation, and closing the mouth of mangrove leaves that are at the seedling level has an impact on the disruption of the photosynthesis process for mangrove plants. This also affects the growth and survival of mangroves that will develop to the level of saplings and trees, if this continues it will result in the death of mangroves at the seedling level and associated marine biota. Waste disposal activities that lead to coastal and marine areas will influence changes in the substrate structure and nutrient composition for the growth and survival of mangroves. In addition, the activity of tethering fishing boats in areas overgrown with mangroves has a negative contribution to the occurrence of oil spills in mangrove habitats, which will affect changes in the composition of nutrients for the growth and survival of mangroves. Not only that, if mangrove logging activities are found, it can result in a decrease in the number or composition of mangrove species (Tokan et al., 2021).

Based on the description above, if it is associated with the findings in this study, it can indicate that the damage to mangroves in the tourist area of Balauring village may not be influenced by internal factors (natural factors), this is because the location of the tourist area overgrown with mangroves is in the bay area, namely Balauring bay. with relatively stable waves and currents, so it is strongly suspected that the main factor causing the destruction of mangroves in the local area is the result of external factors (anthropogenic) with various activities carried out around the area such as waste disposal from household waste, mangrove logging, and ship docking activities. In determining these anthropogenic factors, further studies are needed so that efforts to develop mangrove tourism can be sustainable.

According to the opinion of the local community, prior to the existence of the tourist area, the mangroves in this area were abundant and of various types. However, with the lack of awareness of the community at that time, the exploitation of mangroves in the local area became widespread with the aim of being used for firewood. The current condition of mangroves is the remaining mangroves or able to survive in the current conditions. Thus, the indication of mangrove degradation is the result of a history of mangrove exploitation in the past which cut down various types of mangroves that were growing at that time and now only one type of mangrove is able to survive, namely *Sonneratia alba*. Regarding the use of fishing boat berths around the mangrove ecosystem, it has also been carried out since the past until now, bringing a negative impact from the presence of oil spills that resulted in the demise of mangroves so at the time of observation no mangroves were found from seedling and sapling levels at tourist sites.

An overview of the factors destroying the mangrove ecosystem in the tourist area of Balauring village such as the disposal of garbage and waste from settlements, mangrove logging, and fishing boat docking activities is certainly related to the low level of awareness of the local community about the benefits of the coastal area and the mangrove ecosystem in it as a resource provider. This is in accordance with what Amos (2008) stated that awareness is a state of awakening the soul to something that is happening, further explained that awareness is a person's ability to understand what the problem is and how he should do it. According to Jamanti (2014) and Purwanto (2018), public awareness can be measured by several indicators, one of which is the level of knowledge, so low knowledge will have an impact on low awareness of various things that will be done. In an effort to develop coastal tourism in the mangrove ecosystem of Balauring village, public awareness of the importance of coastal areas as a provider of resources and mangrove ecosystems as a tourist attraction is also the most important habitat for a variety of marine biota is an urgent need that must be immediately carried out by tourism area managers and the local government.

CONCLUSION

The type of mangrove tree found in the tourist area in the coastal area of Balauring village, Omesuri sub-district, Lembata Regency is *Sonneratia alba* with an average density value of 55.56 ind/ha with an average relative density value of 33.33%.

ACKNOWLEDGEMENTS

The authors would like to thank the Research and Community Service Institute, Nusa Cendana University for the funding support for this research through the 2022 fiscal year.

REFERENCES

1. Amos, N. 2008. [Environmental Awareness]. Rineka Cipta. Jakarta. [in Indonesian].
2. Bengen, D. G. 2001. [Coastal and Marine Ecosystems and Natural Resources]. PKSPL-IPB. Bogor. [in Indonesian].
3. BMKG (Meteorology Climatology and Geophysics Council of Lembata Regency) 2022 [Forecast of weather, climate, air quality in Lembata Regency]. Available at: https://www.bmkg.go.id/cuaca/prakiraan-cuaca.bmkg. Accessed: June, 2022.
4. Fredrik, D., Santoso, P., Al Ayubi, A. 2019. Composition and Structure of Mangrove Community On Sapling And Seedling Levels In Coastal of Dolulolong, Lembata, Indonesia. International Journal of Biosciences (IJB). 15(4):153-160p.
5. Jamanti, R. 2014. [The Effect of Flood News in East Kalimantan Newspapers on Environmental Awareness of the Community of Termindung Permai Samarinda Village]. Journal of Communication Studies. 2(1):17-33p. [in Indonesian].
6. [KLH] Ministry of Environment of the Republic of Indonesia. 2004. [Sea water quality standards for marine biota]. Decree of the State Minister of Environment No. 51 year of 2004 about the Seawater Quality Standard. KLH. Jakarta. [in Indonesia].
7. Koda, A. H. S. 2021. [Mangrove Ecological Analysis and the Impact of Community Behavior on Mangrove Ecosystems on the Kokar Coast, Alor Regency, East Nusa Tenggara]. Science Research Journal 23(1):1-7p. [in Indonesian].
8. Lapolo, N. R., Utina, D. K, Wahyuni, Baderan. 2018. Diversity and Density of Crabs in Degraded Mangrove Area at Tanjung Panjang Nature Reserve in Gorontalo, Indonesia. Biodiversitas, 19(3):1154-1159 p.
9. Noor, R. Y., Khazali, M., Suryadiputra, N. N. I. 2012. [Guide to Introduction to Mangroves in Indonesia]. Directorate General, PHKA. Bogor. [in Indonesian].
10. Paulus C. A., Pellokila M. R., Sobang Y. U. L., Azmanajaya E., 2019 The alternative livelihood development strategy in order to improve local fishermen revenue in the border region of Indonesia and Timor Leste. AACL Bioflux 12(1):269-279.
11. Paulus C. A., Soewarlan L. C., Ayubi A. A., 2020 Distribution of marine debris in mangrove ecotourism area in Kupang, East Nusa Tenggara, Indonesia. AACL Bioflux 13(5):2897-2909.
12. Purwanto, N. 2018. [Environmentally Conscious Behavior of Settlers on the banks of the Jelai River, Sukamara Regency]. Journal of Regional and Urban Development 14(1).41-50p. [in Indonesian].
13. Raymond, G., Harahap, N., Soenarno. 2010. [Community Based Mangrove Forest Management in Gending District, Probolinggo]. Journal of Agritek 18(2):185-200p.
14. Retnowati, Y., Sembiring, L., Moeljopawiro, S., Djohan, T. S., Soetarto, E. S. 2017. Diversity of Antibiotic Producing Actinomycetes in Mangrove Forest of Torosiaje, Gorontalo, Indonesia. Biodiversitas. 18(3):1453-1461p.
15. Sambu, A. H. 2014. Analysis of Characteristics of and Use Value of Mangrove Ecosystem (Case Study in Samataring and Tongketongke Sub-Districts, Sinjai Regency). Journal of Environment and Ecology. 5(2):222-233p.
16. Tokan, K. P. C. I., Kangkan, L. A., Al Ayubi, A. 2021. [The Level of Damage and Strategy for Mangrove Ecosystem Management in the Kelapa Tinggi Coast, Mata Air Village, Kupang Regency]. Papadak Maritime Journal 2(1):30-40p. [in Indonesian].
17. Yuliasamaya, Darmawan, A., Hilmanto, R. 2014. [Changes in Mangrove Forest Cover on the Coast of East Lampung Regency]. Sylva Lestari Journal 2(3):111–124p. [in Indonesian].